Claims

1. A process for the processing of waste substances, in particular of residual waste, comprising
   - a mechanical processing of the residual waste
   - a biological processing of the residual waste, by supplying process water (10.2, 9.4, 14.2.11) for dissolving and/or discharging organic constituents, and
   - processing the process water (4.3, 14.1.10, 14.1.11) charged with organic matter by separating off organic constituents from the process water (4.3, 14.1.10, 14.1.11),

   characterized in that
   the process water processing step contains a physico-chemical processing (PCP; 21, 22, 23, 24) for denitrificaton of the process water (9.6) freed from organic constituents.

2. The process in accordance with claim 1, wherein the PCP includes at least one stripper means (21, 22, 22') for separating out ammonia gas dissolved in the process water (16).

3. The process in accordance with claim 2, wherein the process water (20) is injected into a stripper column (22, 22') and there subjected to the injection of air in a counter-flow.

4. The process in accordance with claim 3, comprising a catalyst column (22.8) for converting the ammonia gases into nitrogen and water.

5. The process in accordance with claim 2, wherein the process water (20.1) is injected into a stripper column

(21) and there subjected to the injection of saturated vapor in a counter-flow.

6. The process in accordance with claim 5, comprising a cooler (24) for converting the ammonia gases into nitrogen and water.

7. The process in accordance with any one of claims 2 to 6, wherein stripper means with introduction of air (22) are arranged in series with second stripper means with introduction of air (22') or stripper means with injection of saturated vapor (21).

8. The process in accordance with claim 2 to 7, wherein lye (19) is added to the process water (18) upstream from the stripper means (21, 22, 22').

9. The process in accordance with any one of the preceding claims, wherein the PCP includes a reverse osmosis (23) for separating out pollutants, salts, etc.

10. The process in accordance with any one of the preceding claims, wherein the biological processing takes place in a percolation plant (4), a pulper plant (5), or in a fermentation plant (6).

11. The process in accordance with claim 10, wherein an ultrafiltration (13) of the process water (9.6) precedes the PCP plant (21, 22, 23 24).

12. The process in accordance with any one of the preceding claims, wherein the processing of the process water (9.3) includes a precipitation of chlorides, phosphates, etc.

13. The process in accordance with any one of the preceding claims, wherein the biological processing of the process water (9.3) takes place in a hybrid reactor (9) including

a solid bed (9.2) which comprises sludge discharge means (9.8) and/or means (9.11) for destroying a surface scum.

14. The process in accordance with claim 13, comprising means (9.13) for the injection of air/oxygen (9.13.2) into the head of the hybrid reactor (9).

15. The process in accordance with claim 13 or 14, wherein the hybrid reactor (9) includes means for pressing in gas (9.15) so as to periodically subject a forming bed of sludge (9.2.1) and the solid bed (9.2) to shear forces.

16. The process in accordance with claim 13, 14 or 15, wherein the forming biogas is desulfurized in a desulfurization chamber (9.12) of the hybrid reactor (9).

17. The process in accordance with a combination containing claims 11 and 12, wherein a part of the solids/water mixture (16.1) occurring in the ultrafiltration (13) is added to the precipitation in a downstream location as inoculating sludge (16.3).

18. The process in accordance with any one of the preceding claims, wherein the processing of the process water (4.3) contains a flotation separation (14) for discharging solids.

19. The process in accordance with any one of the preceding claims, wherein the processing of the process water (14.1.10) contains a sand washing stage (14.2) upstream from the biological process water processing and/or a sifting stage (14.3) for separating out floating and fiber substances.

20. The process in accordance with any one of the preceding claims, wherein a sand sedimentation and precipitation plant (25) for the sedimentation of micro-fine sand and

for the precipitation of phosphates, inert substances, etc. is arranged downstream from the sand washing (14).

21. A hybrid reactor, in particular for performing the process in accordance with any one of the preceding claims, comprising a solid bed (9.2), sludge discharge means (9.8), and means (9.11) for destroying a surface scum.

22. The hybrid reactor comprising a desulfurization chamber (9.12) and injection means (9.13) for injecting air/oxygen for a desulfurization of the forming biogas.